Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
Impact Of Middle And Second Mile Access On Broadband And Development	)	GN Docket Nos. 09-47, 09-51, 09-137
NBP Public Notice #11	)	

COMMENTS – NBP PUBLIC NOTICE # 11
OF AT&T INC.

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November 4, 2009

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Pursuant to the Notice of Inquiry ("*Notice*" or "*Inquiry*") released by the Commission on October 8, 2009,[1] AT&T Inc. ("AT&T") submits the following comments.

INTRODUCTION

AT&T appreciates this opportunity to comment on the role that "middle mile" and "second mile" access plays in the availability and deployment of broadband Internet access services. The *Notice* is appropriately targeted in two ways: (1) the focus is on *rural* areas, which are the only areas in which second and middle mile infrastructure warrants serious consideration in the National Broadband Plan,[2] and (2) the Commission seeks an understanding of how middle and second mile supply and demand are likely to evolve over the next five to ten years, rather

[1] Public Notice, *Comment Sought On Impact Of Middle And Second Mile Access On Broadband And Development, NBP Public Notice #11 FCC 09-66*, GN Docket Nos. 09-47, 09-51, 09-137 (rel. Oct. 8, 2009) ("*Notice*" or "*Inquiry*").

[2] *See, e.g.*, FCC National Broadband Plan Workshop, *Wireless Broadband Deployment – General; Transcript*, at 45-46 (Aug. 12, 2009) (T-Mobile USA Senior Vice President Engineering, Neville Ray) (noting that there are plenty of fiber backhaul options in urban and suburban areas).

than a meaningless backwards-looking snapshot of a rapidly changing marketplace. Rural broadband providers often face distance and density challenges that simply do not exist in other areas of the country where broadband providers can reach the Internet with much shorter, more concentrated middle and second mile arrangements. As detailed below, the marketplace has developed many creative market solutions to rural distance/density concerns, and, as the *Notice* appears to recognize, there are powerful economic forces drawing more and more investment in second and middle mile facilities – both wireline and wireless – to serve even remote rural areas. Nonetheless, conditions do, and will continue to, vary, and broadband policy should account for these variations through competitively- and technology-neutral subsidy mechanisms targeted at areas in which rural middle and second mile distance and density issues truly stand as an obstacle to the nation's broadband goals.

As an initial matter, it is worth recognizing the extraordinary successes that rural broadband ISPs have had in overcoming the unique challenges they face and the encouraging signs of even greater future progress. As the Commission determined in its most recent *Broadband Deployment Report*, the percentage of the lowest density zip codes – those with fewer than six persons per square mile – "with at least one high-speed subscriber increased from 73.5 percent in December 2003 to 90.5 percent as of June 2007,"[3] and rural access to broadband has certainly improved further over the past two years. As discussed below, wireless broadband

[3] Fifth Report, *Inquiry Concerning The Deployment Of Advanced Telecommunications Capability To All Americans In A Reasonable And Timely Fashion, And Possible Steps To Accelerate Such Deployment Pursuant To Section 706 Of The Telecommunications Act Of 1996*, 23 FCC Rcd. 9615, ¶ 36 (2008); *see also id.* ("Further, based on the 2007 NTCA Broadband/Internet Availability Survey Report, 99 percent of the NTCA respondents offer broadband service to some part of their customer base. In addition, an OPASTCO membership survey found that on average, respondents make broadband available to over 90 percent of their customer base. Ninety percent of the respondents in that survey reported being able to deliver data speeds of at least one mbps in one direction. Over 75 percent of the respondents also indicated that they compete against two or more providers in the broadband market.").

services are spreading rapidly in rural areas.[4] Moreover, the federal government has already appropriated more than $7 billion for grants, loans, and loan guarantees for yet further broadband deployment in rural areas under the auspices of the American Recovery and Reinvestment Act of 2009,[5] and significant portions of that money have been earmarked for rural middle/second mile projects. And, as the overall demand for broadband services and the amount of bandwidth demanded per customer continues to increase – trends that are both expected to continue strongly over the next five to ten years – the economics of rural broadband service will continue to improve.

Although it is appropriate to examine whether there remain significant barriers to even better rural broadband progress, many of the *Notice*'s specific inquiries ask questions to which meaningful responses simply cannot be provided – and certainly not in the very short period provided for responses. For example, the *Notice* repeatedly asks what is *the* "cost" of this or that input and how that compares to a rural broadband provider's overall costs, but these are questions that cannot be answered with a simple number or percentage, or even a narrow range of numbers. Different rural broadband providers operate in vastly different circumstances, and the role that second and middle mile costs play depends on a host of factors, including population density and distance from core network facilities, the "backhaul" technology used, the nature of the terrain in the relevant rural area, the overall business strategy of the provider, and

[4] *See, e.g.*, Bringing Broadband To Rural American, Report on a Rural Broadband Strategy, Michael J. Copps, 27 (May 22, 2009) ("Rural Broadband Report") ("We estimate that . . . mobile broadband networks cover 95.6 percent of the total U.S.," including "82.8 percent of the U.S. rural population.").

[5] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009) (Recovery Act).

the degree of quality and reliability the provider seeks to offer.[6] Rural broadband providers' second and middle mile costs also depend heavily on the regulatory environment – for example, smaller carriers and ISPs have emphasized that "net neutrality" mandates, by reducing flexibility to deal with very real traffic management issues, would necessarily increase costs and reduce investment in rural broadband services.[7]

Although these issues cannot be reduced to simple answers, there are certain basic principles that we know will hold true. In particular, we know that, all else being equal, it will cost more per-user for a rural ISP far from Internet backbone connection points to obtain second and middle mile Internet connectivity – wireline connectivity that is – than for those in urban centers close to connection points. This is due to two factors. Because rural ISPs are farther from Internet connection points, their second and middle mile facilities must cover much longer distances, which means that the physical facilities necessary to connect the ISP to the Internet will cost more.[8] In addition, population densities in these rural communities are much lower,

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[6] As the Commission has explained, "[r]ural broadband networks typically serve far fewer customers per square mile than urban and suburban networks, and often cover larger land areas that may include challenging topographies and climate conditions, making it extremely costly to provide broadband service to remote areas." Rural Broadband Report, ¶ 113; *see also id.*, ¶ 113, n.275 ("[l]ow population densities coupled with the issue of traversing vast expanses of remote and often rugged topography" create financial barrier to rural broadband deployment"; "[i]n rural America . . . high-costs and low population densities make investment and provision of broadband service uneconomic (just as has been and still is the case with basic voice service pursuant to carrier-of-last resort obligations).") (internal citations omitted).

[7] *See*, *e.g.*, http://blog.broadband.gov/?p=563 (comment of Brett Glass, owner of the rural Wyoming ISP called Lariat) ("any set of 'network neutrality' rules that is imposed by the Commission will require ISPs to supply (and, thus, to buy) more bandwidth").

[8] *See*, *e.g.*, Rural Broadband Report, ¶ 114 ("Although rural broadband networks are fundamentally similar to broadband networks in non-rural areas in that they involve both a local access or distribution network and a backhaul component, rural broadband networks are also typically built in locations that are geographically more removed from internet backbone nodes."); *id.*, ¶ 114, n.182 (quoting NECA "2001 study that 55% of rural switches are more than 70 miles from an Internet Backbone provider node and 10% are more than 200 miles away").

and therefore these higher costs must be spread over fewer customers.[9] The result, inevitably, is higher per-user (or per megabit) costs. Thus, the fact that rural ISPs generally pay more per megabit or per user than urban ISPs is no indictment of rural middle/second mile *prices*, but rather a reflection of economic reality. Indeed, the *per mile* second and middle mile facility rates for larger ILECs, like AT&T, typically vary little from urban to rural areas. In any event, these fundamental challenges – high distance and low population densities in rural areas – cannot be changed, and thus the Commission is correct that wireline broadband deployment will typically face greater challenges in rural areas.

Fortunately, these marketplace realities pose less threat to rural broadband deployment than might be supposed if one wrongly assumed that each individual rural ISP must purchase, at "list" prices, a wireline "special access" connection all the way from its rural exchange to an Internet concentration point (which may be 100 or more miles away). Marketplace participants all across the country have developed myriad ways of mitigating and overcoming the connectivity cost challenges in many rural areas. Many states now have low-cost statewide middle-mile fiber rings (often owned and operated by a consortia of rural telephone and broadband providers) and other states plan to follow suit (with private, state and federal funding).[10] These middle-mile fiber rings dramatically reduce per-user costs by aggregating statewide traffic onto a single very high capacity facility with multiple interconnection points spread throughout the state in close proximity to all but the most remote areas. Rural electric power companies also have existing, ubiquitous infrastructure that they are leveraging to offer

[9] *See supra*, at n.6.

[10] *See, e.g.*, Rural Broadband Report ¶ 118 ("Many rural cooperatives are deploying broadband to rural areas through collaborative efforts and by obtaining federal or state funding support"); *see also id.* n.301 (citing examples of collaborative efforts and federal and state funding to provide rural broadband services").

second and middle mile access to Internet backbones, and rural ISPs are increasingly using these services as well. Cable companies likewise operate in rural and urban areas, usually have self-deployed fiber facilities connected to multiple backbone providers, and are beginning to offer wholesale access to rural ISPs. And wireline competitors such as Level 3 have expressly targeted growing middle and second mile rural demand through extensions and spurs from their fiber networks.

Moreover, whether they choose to purchase second and middle mile connections from ILECs or alternative providers, rural ISPs have many ways to drive hard bargains (at least where providers have the regulatory flexibility to offer discounted offerings). ISPs band together into buying consortia – for example, one organization of ISPs, the Federation of Internet Solution Providers of America ("FISPA"), has used its combined purchasing power to obtain discounted backhaul facilities around the country, including a deal for discounted backhaul throughout AT&T's 22-state region.[11] And the provision of "dedicated" or "managed" Internet service – the service that rural ISPs purchase to obtain connectivity to all of the endpoints of the Internet (also sometimes referred to as "transit" service) – is intensely competitive. Broadband ISPs can choose between all-inclusive connectivity that includes second and middle mile access or "bring your own access" connectivity, and prices have been plummeting for years with deep discounts of 50 percent or more off "list" prices now routine even for single-circuit deals.

But rural ISPs' backhaul options are hardly limited to wireline options – there are many wireless providers today that are targeting backhaul customers in rural areas in recognition of the fact that distance is typically much less of an issue for wireless technologies. Available wireless backhaul options include licensed and unlicensed spectrum solutions, TDM and Ethernet

[11] *See* FISPA website: http://www.fispa.org/offers.php.

protocols, and circuit capacities from T-1 all the way up to 1 Gbps and beyond. Microwave technology is especially well suited to providing backhaul in many rural areas; where line of sight permits, microwave can provide connectivity over long distances without the need for physical facilities, trenching, and other related costs of fiber deployment. In addition, rural LECs and ISPs are also employing wireless backhaul solutions to address density considerations by wirelessly backhauling traffic from a number of rural communities to a central aggregation point at which economical high capacity middle mile facilities may be employed.

In the Commission's broadband workshops, numerous participants have confirmed that wireless backhaul options are increasingly available and cost-effective in rural areas.[12] Both large and small players alike rely upon rural wireless backhaul solutions; for example, AT&T Mobility already uses wireless backhaul widely at its rural cell sites. Providers are also beginning to use abundant rural unlicensed "white spaces" spectrum.[13] Spectrum Bridge, for example, just announced that it is rolling out a wireless backhaul solution using unlicensed

[12] *See* Neville Ray, *National Broadband Plan Workshop*; Wireless Broadband Deployment – General Transcript, at 45-46 (Aug. 12, 2009) ("as you move to suburban fringe and rural areas, those [fiber] opportunities are much tougher to find, but there are good microwave solutions, as Ed [Evans, Stelera Wireless] mentioned, and some carriers are totally deploying their back haul solutions on a microwave basis"); Hunter Newby, *National Broadband Plan Workshop*; Deployment – Wired Transcript, at 30 (Aug. 12, 2009) ("it's the combination of fiber and microwave, which for backhaul from towers that don't have much fiber can cover a much larger swath of the country along this way"); Tom Sawnobori, *National Broadband Plan Workshop*; Wireless Broadband Deployment – General Transcript, at 47 (Aug. 12, 2009) ("There are microwave solutions of significant bandwidth that will support LTE and other fourth generation technologies"); *id.* at 46 (Jake Macleod, Bechtel Telecommunications) ("Obviously, a lot of carriers are now moving to Ethernet, and wireless is definitely a solution, but typically only where you can't get fiber or high-speed Ethernet solution").

[13] *See, e.g.*, Letter from Michele C. Farquhar, Sprint, to Marlene H. Dortch, FCC, Attachment at 6-15 (Oct. 28, 2009).

White Spaces spectrum on a trial basis in Virginia,[14] and FiberTower's Chief Operating Officer has told Congress that a wireless connection using Whitespaces could be installed at a relatively low cost compared to "trenched fiber," which "would normally be at least 20 or 30 times more expensive, not to mention the extended time period to build and implement."[15] And in some areas, especially very remote areas, satellite access to backbone services may prove to be the most cost effective option, which could avoid the need for any terrestrial backhaul facilities at all.

In short, rural backhaul options are continually expanding, and as the economics of rural backhaul continue to improve the marketplace will overcome remaining challenges in many areas over the next five to ten years. Because distance and density are likely to continue to pose challenges in some rural areas, however, the Commission may well need to take action to ensure that adequate broadband services are available in those areas and that the nation's broadband goals are fully realized.

The nature of these challenges, however, is not new. Indeed, nationwide deployment and availability of broadband services pose the same basic challenges, rooted in distance and density, as the challenge of nationwide availability of phone service or cable service. And through long trial and error over the decades, we have learned what works: technologically and competitively neutral subsidy mechanisms. The Commission's universal service support mechanisms provide explicit subsidies regardless of technology, which allows basic phone service to be available

[14] Press Release, "First White Spaces Network Brings Broadband Internet to Rural America over Unused TV Broadcast Airwaves," http://spectrumbridge.com/web/images/pdfs/PR/claudville-whitespaceproject-pressrelease.pdf (Oct. 21, 2009).

[15] Written Testimony of Ravi Potharlanka, COO FiberTower Corporation, House Energy and Commerce Committee's subcommittee on Communications, Technology and the Internet Hearing: Competition in the Wireless Industry, at 7 (May 7, 2009) ("FiberTower Congressional Testimony").

across the nation without attempting to pick technological winners and losers. Similarly, although subsidies will likely be needed to meet broadband goals in some rural areas, the Commission cannot accurately predict which business strategies and technologies will lead to the best and most cost-effective backhaul solutions in those areas, nor should it try. The Recovery Act provides a good start to this process, and NTIA and RUS have received many proposals for grants and subsidies that would facilitate targeted buildout of second and middle infrastructure in unserved and underserved areas.[16] To the extent additional action is necessary, the Commission should build on those efforts with explicit and neutral subsidies carefully targeted to those rural areas that truly need help.

Some, however, will undoubtedly use this *Notice* as yet another occasion to repeat their baseless calls for re-regulation of the price cap ILECs' mostly *non-rural* special access services. The Commission already has an ongoing proceeding in which it is considering price cap ILECs' special access pricing, and that proceeding – in which the Commission will first seek comment on an appropriate framework for assessing special access competition and ensure that it has the data it needs to apply that framework – is obviously better suited to examine the full context of those issues. But as AT&T has repeatedly shown, artificially slashing price cap ILECs' DS1 and DS3 rates, as some have suggested, would be counterproductive in any context, because it would only create disincentives for investment in new backhaul facilities. That economic reality

[16] *See, e.g.*, NTIA website: http://www.ntia.doc.gov/broadbandgrants/; *see also* Reply Comments of ACA, GN Docket No. 09-51, at 9-10 (July 21, 2009) (citing broad support for need to encourage broadband deployment by providing federal subsidies for middle mile investment); *see also, e.g.*, http://www.ntia.doc.gov/broadbandgrants/applications/summaries/511.pdf.; Sean Buckley, *Level 3 poses itself as middle mile broadband provider*, Fierce Wireless (Aug. 23, 2009), http://www.fiercetelecom.com/story/level-3-poses-itself-middle-mile-broadband-provider/2009-08-23 (Level 3 has applied for middle mile funds, asserting that "it plans to use a combination of the funding and its own money to install new equipment in existing buildings located in rural areas along the route of its network" to "create . . . middle mile connections" to serve its rural customers, as well as "government agencies," "local schools" and "colleges.").

applies with particular force here; indeed, it would be directly contrary to the nation's rural broadband goals to further increase incentives to deploy new second and middle mile rural solutions just as those solutions are gaining widespread acceptance.[17]

As to the broader special access issues, the record in the special access proceeding confirms beyond serious doubt that competitive transport networks have long blanketed the commercial areas where demand for high capacity services is concentrated.[18] AT&T has previously submitted data showing that the majority of its demand for DS1 and DS3 services is either already connected to or within about 1000 feet of known CLEC facilities. AT&T also submitted data showing that less than 20 percent of its wire centers account for more than 80 percent of AT&T's DSn-level demand (as shown below, this concentration is even higher for OCn and Ethernet services), and showing their proximity to CLEC fiber and collocations and to carrier hotels. Both the Commission and the antitrust authorities have repeatedly recognized that CLECs can (and routinely do) extend their facilities to new locations that are close to their existing networks.[19] In this environment, competitive bidding for special access services has become routine, with price cap LECs bidding against multiple non-ILEC providers.[20]

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[17] As Commissioner Copps has explained, [t]he solution for rural broadband should reflect consideration of the full range of technological options available, and should not elevate the need for short-term progress over longer-term objectives." Rural Broadband Report, ¶ 11.

[18] *See* Competitive Issues in Special Access Markets, National Regulatory Research Institute (NRRI), at 52 (Jan. 21, 2009) ("NRRI Report") ("Verizon's maps demonstrate that CLECs have built fiber rings and meshes in city after city, covering major portions of the urban areas. The maps show that competitors have established direct service at hundreds of locations."); *see also* High-Capacity Services: Abundant, Affordable, and Evolving, at 2 (attached to Letter From Glenn T. Reynolds (USTelecom) to Marlene H. Dortch (FCC), WC Docket No. 05-25 (July 16, 2009) ("USTelecom Special Access Report") (Commission opened special access to competition in the 1980's, and by the early 1990's the Commission was already concluding that many large customers did not use ILEC facilities at all).

[19] *See*, *e.g.*, Memorandum Opinion and Order, *AT&T Inc. and BellSouth Corporation Application For Transfer Of Control*, 20 FCC Rcd. 18290, ¶ 42 & n.114; Decl. of W. Robert Majure at 14, *United States* v. *SBC Communications Inc.*, Civil Action No. 1:05-CV-02102 at 14

But as consumer demand for broadband services has continued to increase – and in particular, with the explosion in consumer demand for *wireless* broadband services – competitive options for broadband backhaul are rapidly expanding throughout urban and suburban areas (and increasingly in rural areas as well).[21] An extraordinarily large array of companies are rushing to build new high-capacity facilities or expand their existing ones, ranging from CLECs like Level 3 to the cable companies to wireless providers like Clearwire and FiberTower, and dozens of others.[22] For example, cable companies – which today serve 56 percent of wireline broadband subscribers – already have ubiquitous cable and fiber networks that are tailor-made for adaptation to serve backhaul customers.[23] For this reason, cable companies have been investing billions of dollars to upgrade their fiber networks to offer high-capacity transport and Ethernet connectivity, and have been steadily increasing their share of high-capacity traffic.[24] As Comcast just repeated, it views wireless backhaul as a billion dollar opportunity.[25]

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n.17 (D.D.C. Aug. 7, 2006); *see also Earthlink Inc.* v. *FCC*, 462 F.3d 1, 11 (D.C. Cir. 2006) (upholding FCC finding that "market share alone" is not "dispositive," but that "actual and potential intermodal competition" would "inform[] rational competitors' decisions").

[20] *Id.* at 56-57 & n.185.

[21] *See, e.g.*, Reply Comments of AT&T Inc., WT Docket No. 09-66, at 11, 22, 29-30 (filed July 13, 2009); Comments of AT&T Inc., WT Docket No. 09-66, at 20, 25-26, 33-34 (filed June 15, 2009); AT&T Supplemental Comments, WC Docket No. 05-25, Casto Declaration at ¶¶ 7-23, 55-60 (filed Aug. 8, 2007); AT&T Supplemental Reply Comments, FCC WC Docket No. 05-25, at 7-23 (filed Aug. 15, 2008) (summarizing sworn testimony of AT&T, Verizon, Qwest and Embarq and identifying the detailed Exhibits submitted by these incumbents).

[22] *See* Letter from James W. Cicconi, AT&T, to Marlene H. Dortch, FCC, WC Docket No. 05-25, at 2-4 (filed June 22, 2009).

[23] USTelecom Special Access Report, at 9.

[24] *See, e.g.*, NRRI Report at 60-61; Dallas Clement, *National Broadband Plan Workshop*; Deployment – Wired Transcript, at 35 (Aug. 12, 2009) ("Relative to wireless back haul from cell sites . . . in our commercial business it's a growth area. We're getting calls in our franchises from wireless providers who are preparing for their 4G networks and they're looking for lower cost alternatives for back haul. And because we're there and we can do sort of spurs off of our network, we feel as though it's a big growth area and we're deploying capital to that area to be

Microwave backhaul is also quickly becoming much more important. The economics of microwave backhaul have been proven for years, and microwave has long been the most common form of backhaul in Europe and the rest of the world.[26] Indeed, as a Sprint officer has previously explained, the only reason wireless backhaul services are not more prevalent here is not because they are unavailable, untested or uneconomic, but because abundant and inexpensive DS1s have "stifled the technology here" in the United States.[27] In the U.S., as of 2007, "[r]oughly 20% of mobile base stations . . . [were] backhauled via wireless technologies," and that percentage is expected to double by 2011.[28] Clearwire recently indicated that 90 percent of its wireless network is served by microwave backhaul, and it will be supplying backhaul for Sprint's 4G network (although Clearwire has acknowledged that it will not focus on rural

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able to satisfy that demand"); Neville Ray, *National Broadband Plan Workshop*; Wireless Broadband Deployment – General Transcript, at 45-46 (Aug. 12, 2009) ("I think that competitive forces work in metro areas where there's a lot of fiber, be that from the utility company, from the cable company, from the existing, you know, telco provider"); Yankee Group 4G Network Backhaul Summit, *PowerPoint Presentation of CFN Services*, at 4 (Sept. 15, 2009) ("Time Warner, Comcast, Cox and other MSOs are adding cell sites to their existing (typically Ethernet) fiber networks").

[25] Comcast 3rd Quarter 2009 Results, at 11 (Nov. 4, 2009), *available at* http://www.cmcsk.com/earningdetails.cfm?QYear=2009&QQuarter=3.

[26] USTelecom Special Access Report at 37-38; E. Boch, *Backhaul for WiMax and LTE: High Bandwidth Ethernet Radio Systems*, Microwave Journal, International Edition, at 22 (Nov. 2008) ("Wireless implementations of metro backhaul have long dominated in Europe. In North America, however, more TDM copper backhaul has been historically employed primarily as a result of low cost ILEC T1 TDM circuits available through U.S. unbundling regulations").

[27] Stephen Lawson, *Sprint Picks Wireless backhaul for WiMax*, The Industry Standard (July 9, 2008), *available at* http://www.thestandard.com/news/2008/07/09/sprint-picks-wireless-backhaul-wimax (Sprint CTO states that only reason microwave backhaul is not already as prevalent here as it is in the rest of the world is that "relatively abundant and inexpensive T-1s have stifled the technology here").

[28] Comments of Qwest Communications International, Inc., Special Access Rates for Price Cap Local Exchange Carriers, WC Docket No. 05-25, at 29, (filed Aug. 8, 2007) (*citing* Visant Strategies, *US Mobile Backhaul: Evolving Market 2007*, available at http://www.visantstrategies.com/Prback2007.html).

areas).[29] U.S. Cellular has reported that it "makes very extensive use of . . . common carrier microwave facilities to link its base stations with each other and with USCC's switches;"[30] and, indeed, it already uses such backhaul facilities to serve approximately 40 percent of its cell sites.[31] There is thus clearly no *general* special access problem to solve, nor is there any sound basis to address the distance/density concerns unique to rural areas with a sweeping special access "solution" that would discourage the very market activity that promises vastly to improve rural broadband conditions.

In short, the challenges in ensuring universal availability of broadband are significant, but with the focus the Commission is bringing to these issues there is hope that the nation's broadband goals can be achieved – *if* the Commission pursues the right policies. Targeted competitively and technologically neutral subsidies are a proven method of overcoming the challenges of distance and density and of maximizing deployment in the most rural areas. Other policies the Commission is considering, however, will undercut these goals. For example, net neutrality mandates will hit rural areas the hardest, by increasing the bandwidth and thus the cost necessary to serve those areas. Artificial government-mandated rate reductions for second and middle mile facilities services would similarly create disincentives for investment and skew competition by disfavoring certain technologies (such as wireless). With this perspective, AT&T submits the following responses to the Commission's specific questions.

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[29] *See also* Yankee Group 4G Network Backhaul Summit, *PowerPoint Presentation of John Saw, CTO Clearwire* (Sept. 15, 2009) ("90% of Clearwire cell sites use microwave backhaul; Largest wireless backhaul network in North America"; "Rapid rollout," "Very low recurring costs," "Tremendous scalability, 50 Mbps – 1 Gbps of backhaul per site").

[30] Comments of U.S. Cellular Corp., WT Docket No. 09-106, at 1 (filed Jul. 27, 2009).

[31] In July, U.S. Cellular reported that it had 2,350 microwave backhaul connections, *id.*, out of about 6,400 total cell sites. http://en.wikipedia.org/wiki/U.S._Cellular (last checked Sept. 25, 2009). U.S. Cellular thus has microwave backhaul connections to approximately 40 percent of its cell sites.

RESPONSES TO INDIVIDUAL QUESTIONS

I. QUESTION NO. 1.

Network Components of Broadband Connectivity. To provide broadband service to consumers and small business in an area, a broadband Internet service provider needs to have adequate, reasonably priced, and efficiently provided access to both second mile and middle mile connectivity.

Question 1.a. On a per-end user connection basis, how much middle mile capacity is needed to provide adequate broadband Internet access to that end user connection? How does the needed capacity for middle mile connectivity vary by the number of customers or usage characteristics of the customers base in a particular location? How does this capacity vary upon the usage patterns or demands of particular end user customer segments?

Question 1.b. On a per-end user connection basis, how much second mile capacity is needed to provide adequate broadband Internet access to that end user connection? How does the needed capacity for middle mile connectivity vary by the number of customers or usage characteristics of the customers base in a particular location? How does this capacity vary upon the usage patterns or demands of particular end user customer segments?

Response to Questions 1.a and 1.b. There is no mathematical or engineering formula for determining the per-user second or middle mile capacity needed to provide "adequate broadband Internet access." As an initial matter, the Commission has not defined what it means by "adequate" broadband Internet access. In all events, the Commission correctly recognizes that the answer to this question depends on a number of factors, including the "the usage characteristics of the customer base" and, relatedly, the "usage patterns or demands of particular end user customer segments." For example, customers whose usage characteristics require higher speeds, lower latency, and higher reliability, will generally require more bandwidth, and hence more second/middle mile capacity. Similarly, an ISP that serves customers who tend to access the Internet at the same time, will require more capacity overall, including second and middle mile capacity, than an ISP with customers whose usage is spread out throughout the day.

The practices of the ISPs themselves also have a significant impact on the amount of second/middle mile capacity needed to serve customers adequately. An ISP that more efficiently

manages it network traffic – for example, by caching, limiting users from monopolizing capacity at peak periods, and other practices – will be able to provide a higher level of service with less second and middle mile capacity than an ISP that less effectively manages its network.

In this regard, the regulatory environment can also have an enormous impact on the amount of second/middle mile capacity an ISP needs to serve its customers. For example, as rural ISPs and others have stressed, the need for bandwidth – and second/middle mile capacity – would greatly increase under a regime of "net neutrality" rules that limit network operators' ability to manage their networks to ensure adequate quality of service to all consumers.[32]

Question 1.c. What are the technology options for providing adequate middle mile connectivity for the next 5-10 years? To what extent are these technologies available in rural or unserved portions of the country? Please explain how the cost and bandwidth capacity of each technology option compares to other technology options and how those factors related to projected demand for middle mile connectivity in different areas of the country, both rural and urban. For instance, will DS1 and DS3 connectivity over copper wire networks for the middle mile connectivity over copper wire networks for the middle mile be sufficient for a community's broadband needs over the next 5-10 years? Will microwave or other wireless options be able to provide cost-effective middle mile connectivity to meet those projected needs, and how does spectrum availability impact the cost-effectiveness of these wireless options. For fiber optic networks, which technology, such as OCn, Fast Ethernet, or Gigabit Ethernet, offers the most efficient means of providing a middle mile connection to the Internet core network? Does the cost-effectiveness of certain middle-mile technologies vary by geographic area, distance, or population density? If so, to what extent?

Question 1.d. What are the technology options for providing adequate second mile connectivity for the next 5-10 years? To what extent are these technologies available in rural or unserved portions of the country? Please explain how the cost and bandwidth capacity of each technology option compares to other technology options and how those factors related to projected demand for middle mile connectivity in different areas of the country, both rural and urban. For instance, will DS1 and DS3 connectivity over copper wire networks for the and second mile connectivity over copper wire networks for the second mile be sufficient for a community's broadband needs over the next 5-10 years? Will microwave or other wireless options be able to provide cost-effective middle mile connectivity to meet those projected needs,

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[32] *See, e.g., See Fostering Innovation and Investment in the Wireless Communications Market, et al.*, GN Docket No. 09-157, Comments of MetroPCS at 31-35 (Sept. 30, 2009); http://blog.broadband.gov/?p=563 (comment of Brett Glass, owner of the rural Wyoming ISP called Lariat) ("any set of 'network neutrality' rules that is imposed by the Commission will require ISPs to supply (and, thus, to buy) more bandwidth").

and how does spectrum availability impact the cost-effectiveness of these wireless options. For fiber optic networks, which technology, such as OCn, Fast Ethernet, or Gigabit Ethernet, offers the most efficient means of providing a second mile connection to the Internet core network? Does the cost-effectiveness of certain second-mile technologies vary by geographic area, distance, or population density? If so, to what extent?

Response to Questions 1.c & 1.d. The Commission is correct to be asking what technology options will be prevalent in the *future* for backhaul for rural broadband services. Too often during the past decade, purchasers of second and middle mile transport have argued for price reductions by regulatory fiat, based on short-sighted arguments that accept legacy technologies as a permanent reality with little or no grasp of how potential competition is shaping competition and providers' investment and deployment decisions. AT&T thus strongly supports the Commission's inquiry into how different competitive technologies will be used to provide second and middle mile connectivity in rural areas over the next several years.

Although there is no crystal ball that can predict future technologies, there are several well-established and growing second and middle mile broadband transport technologies that exist today and that likely will be the dominant technologies in rural areas in the coming years. It is important to recognize at the outset, however, that we are now at a technology crossroad. The consumer bandwidth demands triggered by multimedia and other broadband uses are exploding, and as a result second mile and middle mile capacity needs – even in many rural areas – are already outstripping the useful capacity of legacy copper and TDM-based DS1 and DS3 facilities. As a result, copper connections (DS1s and DS3s) are on the decline and are being replaced by larger capacity services to meet this ever increasing demand. No provider has any special marketplace advantage in deploying these higher capacity facilities. The playing field is therefore level in the sense that there are no incumbents with sufficient capacity to serve all of this demand, and all competitors will have to build and extend new facilities. The two

technologies that, at least for today, are having the most success and will likely serve most rural second and middle mile demand over the next several years are wireless and fiber technologies.

Wireless Technologies. Point-to-point wireless technology is gaining rapidly as a second and middle mile technology. Although this technology is a relative newcomer in the U.S. due to the historic low prices of copper wireline DSn services, wireless technologies are already the dominant technology for providing second and middle mile transport for mobile wireless broadband services in much of the rest of the world.[33] Point-to-point wireless services are able to provide circuit-based (*e.g.*, T1, T3, OCn) and packet-based (*e.g.*, Ethernet) connectivity at speeds on par with wireline services,[34] and these wireless services include quality standards that rival those of wireline services.[35]

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[33] *See* Knowledge Center, TTM, *http://www.ttmi.info/knowledge; see also* E. Boch, *Backhaul for WiMax & LTE: High-Bandwidth Ethernet Radio Systems*, Microwave Journal, International Edition, at 22 (Nov. 2008); *see also* J. Barthold, *Backhaul Drives NextLink's Purchase Agreement with DragonWave*, Telecom Magazine (Jan. 31, 2008) (statement by DragonWave vice president of product management Alan Soheim: "North America has some of the lowest leased line data rates in the world and even so it doesn't work for scaling to next generation services. In other markets, Canada, Europe, the Middle East, it's pretty much a no-brainer to go with alternate network technologies."); S. Lawson, *Sprint Picks Wireless Backhaul for WiMax, Industry Standard* (July 9, 2008), http://www.thestandard.com/news/2008/07/09/sprint-picks-wireless-backhaul-wimax (citing Sprint CTO Barry West) (reason that fixed wireless is not more prevalent in the United States is because "relatively abundant and inexpensive T1-1 lines" have provided and "attractive alternative here").

[34] *See, e.g.*, FiberTower, http://www.fibertower.net/corp/company-spectrum-assets.shtml (providing data rates up to "1.5 Mbps-1 Gbps" and "applications" include "Backhaul, Access, NxT1, OC3, [and] Carrier Ethernet"); Wireless Broadband Hearing, Tr. at 37 (Stelera Wireless founder and CEO Ed Evans: "[W]e aggregate through microwave back to a single long-haul Ethernet connection"); *id.* at 46 (Bechtel Telecommunications principal vice president and CTO Jake MacLeod: "Obviously, a lot of the carriers now are moving to Ethernet, and wireless is definitely a solution").

[35] *See, e.g.*, USTelecom Special Access Report, at 20 ("Fixed wireless providers offer high-speed connections ranging from DS-1 to Gigabit Ethernet to OCn"); FiberTower, http://www.fibertower.com/corp/solutions-backhaul.shtml (Wireless backhaul "[c]ustomers can expect new service standards in backhaul, exceeding anything delivered through copper T1s or the ILEC.").

Point-to-point wireless technologies can have significant advantages over their wireline counterparts. They can be installed in a matter of days, whereas fiber connections take much longer.[36] Further, the cost of deploying a wireless connection can be much lower than that of fiber facilities. A typical wireless provider locates one or more antennae at a location with fiber connectivity to the Internet backbone and serves remote locations merely by installing an antenna and equipment at those remote locations, and provides Internet access by establishing a wireless connection with the first antenna. As FiberTower's Vice President of Government and Regulatory Affairs has explained, "[y]ou can literally cover over a hundred miles and you're talking less than $100,000 in equipment rather than millions to put in fiber."[37]

Moreover, in addition to using licensed spectrum, wireless services can use unlicensed spectrum. With this approach, the Chief Operating Officer of FiberTower recently explained that a wireless connection using Whitespaces could be installed at a relatively low cost compared to "trenched fiber," which "would normally be at least 20 or 30 times more expensive, not to mention the extended time period to build and implement."[38] Spectrum Bridge just announced that it is rolling out a wireless backhaul solution using unlicensed White Spaces spectrum on a

[36] *See, e.g.*, FiberTower Congressional Testimony, at 7 (whereas fiber can take an "extended time period to build and implement," "[f]ixed wireless links can often be installed in a matter of days.").

[37] Pressure Grows on FCC to Release Wireless Backhaul Notice, Communications Daily (Apr. 7, 2009).

[38] FiberTower Congressional Testimony, at 7.

trial basis in Virginia.[39] Sprint and others recently submitted an ex parte showing that White Spaces spectrum is relatively abundant in rural areas.[40]

For these and other reasons, there is no question that point-to-point wireless technology is among the most important providers of rural, second and middle mile transport solutions.[41] Indeed, there already are numerous providers of wireless backhaul facilities and services in the U.S., including, among others, FiberTower, TowerCloud, Level 3, Conterra Telecom Services, NextLink, Clearwire/Sprint, Sparkplug, DragonWave, Ceterra, and TTM Inc. Together, these providers have capacity to provide service virtually anywhere in the United States, and they are rapidly deploying second and middle mile services deep into rural areas.[42] Indeed, adoption of

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[39] Press Release, "First White Spaces Network Brings Broadband Internet to Rural America over Unused TV Broadcast Airwaves," http://spectrumbridge.com/web/images/pdfs/PR/claudville-whitespaceproject-pressrelease.pdf (Oct. 21, 2009).

[40] *See*, *e.g.*, Letter from Michele C. Farquhar, Sprint, to Marlene H. Dortch, FCC, Attachment at 6-15 (Oct. 28, 2009).

[41] *See* Neville Ray, *National Broadband Plan Workshop*; Wireless Broadband Deployment – General Transcript, at 45-46, Aug. 12, 2009 ("as you move to suburban fringe and rural areas, those [fiber] opportunities are much tougher to find, but there are good microwave solutions, as Ed [Evans, Stelera Wireless] mentioned, and some carriers are totally deploying their back haul solutions on a microwave basis"); Hunter Newby, *National Broadband Plan Workshop*; Deployment – Wired Transcript, at 30, Aug. 12, 2009 ("it's the combination of fiber and microwave, which for backhaul from towers that don't have much fiber can cover a much larger swath of the country along this way"); Sawnobori, *National Broadband Plan Workshop*; Wireless Broadband Deployment – General Transcript, at 47, Aug. 12, 2009 ("There are microwave solutions of significant bandwidth that will support LTE and other fourth generation technologies").

[42] *See*, *e.g.*, Reuters, Level 3 Launches Wireless Tower Access Service (Oct. 22, 2009), http://www.reuters.com/article/pressRelease/idUS104298+22-Oct-2009+BW20091022 ("Level 3 Communications, Inc. today announced the launch of Level 3 Tower Access - a new service that offers direct wireless tower connectivity to the Level 3 network. Tower Access provides wireless carriers with more efficient and cost-effective options for wireless backhaul in metropolitan and rural locations. The first phase of this initiative will target unserved and underserved markets focusing on areas with the greatest concentration of end-user demand."); DragonWave, http://www.dragonwaveinc.com/solutions-rural.asp ("DragonWave's packet microwave solutions are ideally suited to the unique challenges associated with deployments in rural and other low density regions, offering several fundamental benefits including: Rapid

wireless second and middle mile connectivity is widespread in rural areas. T-Mobile, recently explained that "as you move to suburban fringe and rural areas, those [fiber] opportunities are much tougher to find, but there are good microwave solutions, as Ed [Evans, Stelera Wireless] mentioned, and some carriers are totally deploying their back haul solutions on a microwave basis."[43] Sprint has likewise stated that, with respect to its Clearwire WiMax network, it "will use self-provisioned microwave backhaul to handle the high-bandwidth requirements associated with 4G applications to the maximum extent possible."[44] Stelera Wireless – which provides

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deployment times measured in days, not months; >1 Gbps scalability; flex[ible] bandwidth: offering simple, remote, pay-as-you-grow capacity increases; [a]dvanced automatic adaptive modulation, resulting in longer hops, higher capacity and smaller antenna sizes"); Reuters, *DragonWave Wireless Backhaul Equipment Helps Bring High-Speed Broadband Access to Rural Georgia* (March 10, 2009), http://www.reuters.com/article/pressRelease/idUS111245+10-Mar-2009+MW20090310 ("DragonWave[,] a global supplier of high-capacity, wireless native Ethernet backhaul solutions for mobile and access networks, today announced that the South Georgia Regional Information Technology Authority . . . has deployed DragonWave's Horizon Compact radios in a state-of-the-art broadband network throughout Baker, Calhoun, Early, Miller and Mitchell counties in South Georgia."); Ceragon, Rural Broadband Wireless Backhaul, http://www.ceragon.com/page.asp?ID=17 ("Ceragon solutions are helping to bring broadband services to regions and communities that until recently had no access to online services. Our advanced high-capacity wireless IP solutions are ideal for carrying a variety of data services, enabling cost efficient network set-up and fast ROI."); Jean-Pierre Joosting, *Ceragon and Alvarion collaborate on 4G rural network deployment*, Microwave Engineering (Oct. 9, 2009), http://www.mwee.com/mwee_news/220600046 ("Ceragon Networks, a provider of high-capacity wireless backhaul solutions, has announced that it will partner with Alvarion as wireless backhaul equipment provider to deploy a network for Open Range Communications. The new network is planned to be the largest Rural Utilities Service (RUS) funded deployment in the United States, spanning 17 states, 546 rural communities, and reaching up to 6 million people."); Reuters, Stelera Selects Ceragon IP Solutions to Backhaul Wireless Broadband in Rural America (May 4, 2009), http://www.reuters.com/article/pressRelease/idUS64859+04-May-2009+PRN20090504 ("Utilizing Ceragon's solutions, Stelera is building out a high-capacity wireless backbone that would serve to bring the benefit of broadband internet access to underserved communities in rural America."); FiberTower, http://www.fibertower.net/corp/company-spectrum-assets.shtml ("covering 99% of the United States," including in "suburban and rural markets").

[43] Wireless Broadband Hearing, Tr. at 45-46 (T-Mobile USA Senior Vice President Engineering, Neville Ray).

[44] Sprint Comments in GN Docket No. 09-51, at 5; *see also* Yankee Group, *4G Network Backhaul Summit*, at 14 (Sept. 15, 2009) (presentation of John Saw, CTO, Clearwire) ("90% of

wireless broadband in rural areas using AWS spectrum and HSPA technology – has stated that "[w]e don't have a problem with back haul because we're using 300 MIP microwave off of those cell sites, so I've got plenty of back haul capacity to go back. So there's no issue there."[45] U.S. Cellular likewise reports that it "makes very extensive use of . . . common carrier microwave facilities to link its base stations with each other and with USCC's switches;"[46] and, already U.S. Cellular uses such backhaul facilities to serve approximately 40 percent of its cell sites.[47] FiberTower has reported that its company can provide wireless backhaul to half of all cell towers in the U.S.[48]

The growing availability and adoption of wireless point-to-point services for second and middle mile transport is no surprise to AT&T. AT&T's LEC operations – which provide fiber-based second and middle mile services – routinely compete against wireless providers to win and keep customers.[49] Moreover, AT&T Mobility purchases thousands of point-to-point wireless circuits for middle mile connectivity (backhaul) from cell towers to its fiber network.[50]

Clearwire cell sites use microwave backhaul," and there is "[t]remendous scalability," with "50 Mbps – 1 Gbps of backhaul capacity per site").

[45] Wireless Broadband Hearing, Tr. at 42-43 (Stelera Wireless founder and CEO Ed Evans).

[46] Comments of U.S. Cellular Corp., WT Docket No. 09-106, at 1 (filed Jul. 27, 2009).

[47] In July, U.S. Cellular reported that it had 2,350 microwave backhaul connections, *id.*, out of about 6,400 total cell sites. http://en.wikipedia.org/wiki/U.S._Cellular (last checked Sept. 25, 2009). U.S. Cellular thus has microwave backhaul connections to approximately 40 percent of its cell sites.

[48] *See* USTelecom Special Access Report, at 36.

[49] AT&T provided specific examples of competition by wireless providers and AT&T's responses to that competition in the ongoing special access proceeding. *See*, *e.g.*, AT&T 2007 Special Access Comments, WC Docket No. 05-25, Supplemental Declaration of Parley Casto (filed Aug. 15, 2007); *see also* USTelecom Special Access Report, at 35-36.

[50] *See*, *e.g.*, Written Statement of AT&T, Inc., An Examination of Competition in the Wireless Industry, Before the Subcommittee On Communications, Technology and the Internet, United States House of Representatives, at 5 (filed May 4, 2009).

Fiber Technologies. Fiber-based solutions will also play a large role in some rural areas over the next few years in meeting the extraordinary demand being generated by modern broadband services. Those fiber-based solutions will likely include the full gamut of services, including circuit-based services, and Fast Ethernet and Gigabit Ethernet packet-based services. There are numerous competing providers of fiber-based second/middle mile facilities in many rural areas, including, among others, incumbent local exchange carriers ("ILECs"), independent telephone companies ("ICOs"), competitive local exchange carriers ("CLECs"), cable companies, electric utility companies, cooperatives, state run network providers, and others. For many years now, downtown and suburban areas have been blanketed with fiber facilities from multiple CLECs, cable companies, and others.[51] During the past several years, these fiber providers have been aggressively extending their networks further and further into rural areas, as the exploding demand from mobile wireless cell towers and rural ISPs in these rural areas have made such deployment increasingly profitable.[52] As just one example, "Level 3 has an extensive fiber-optic footprint in Vermont, which passes more than 7,000 businesses in such cities as Burlington, Rutland and Brattleboro" and Level 3 recently announced that it "has more than doubled network capacity in Vermont over the past year and now offers multiple levels of redundancy, which better facilitates business continuity and disaster recovery."[53]

[51] The widespread deployment of competing wireline networks has been repeatedly documented in the ongoing special access proceedings, *see*, *e.g.*, Reply Comments of AT&T Inc., WC Docket No. 05-25 (Aug. 15, 2007) (summarizing the data showing the wide spread deployment of competing networks of ICOs, cable, CLECs, and others); *see also* USTelecom Report at 23-42.

[52] *See* USTelecom Report at 23-42.

[53] Level 3 Press Release, *Level 3 Increases Network Capacity in Vermont; Names New General Manager for New England Region* (Nov. 3, 2009), http://www.level3.com/index.cfm?pageID=491&PR=818.

Even if an individual rural ISP's demand would not justify deployment of a new fiber facility, the marketplace has developed many ways for such ISPs to aggregate their demand and obtain connectivity. For example, one of the largest impediments to extending fiber into rural areas, is that the very low demand in any given rural area can make the per unit (*e.g.*, per megabit) cost of such facilities relatively high. In more than 20 rural states, rural ILECs have banded together to address this problem by constructing statewide fiber rings. These rings allow these ILECs to aggregate their traffic on higher capacity facilities that reach most rural areas within the state, which effectively reduces the distance and increases the population densities served by such facilities. These fiber rings can dramatically reduce the per-user costs for rural ISPs.[54]

The networks deployed by these LECs include, among many others, "Vision Net's 100% digital fiber network" that "spans over 2800 miles from the North Dakota border to western Montana with local points of presence in major and rural markets,[55] DCN's fiber network "serv[ing] . . . every community in North Dakota, providing services that include Carrier Ethernet, Private Line, ATM, Frame Relay and high speed Internet access,"[56] Iowa Network Services' ("INS's") "state-wide fiber optic network" that allows "cost effective[]" connections "with even the smallest communities,"[57] and U.S. Carrier Telecom's network that is "a one-source provider of light-speed wholesale telecommunications to and from major cities and rural communities throughout Georgia and the Southeast."[58]

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[54] *See*, *e.g.*, Indatel Group (a group of 22 fiber network owners providing fiber-based service to rural areas in 22 states), http://www.indatelgroup.org.

[55] http://www.vision.net/home.php.

[56] http://www.dakotacarrier.com/about/index.asp.

[57] http://www.iowanetworkservices.com/About_Us.aspx.

[58] http://www.uscarrier.com/History.html.

Utility companies are likewise well positioned to provide fiber-based second and middle mile services to ISPs located in rural areas. Electric companies have increasingly been taking advantage of their existing rights of way and network management infrastructure to deploy and operate fiber networks. These fiber networks typically extend to the rural areas where a large portion of their facilities (such as coal plants) are located, and allow the offering of fiber transport services in those rural areas. For example, DukeNet, a subsidiary of Duke Energy, provides fiber-based second and middle mile solutions in five Southeastern states, with points-of-presences in several rural areas.[59]

Other providers economize by leveraging off of their other business ventures. For example, cable companies have for years been deploying fiber facilities throughout their service territories as part of their provision of cable television and Internet services. Having deployed these large fiber networks – which they already use to self-supply second and middle mile connectivity for their own ISP services – cable companies have begun to use their fiber facilities to offer Internet connectivity to small, medium, and large businesses.[60] For example, Charter, Mediacom, Insight, WOW, and Cable ONE have broadband networks extending into rural areas. Cable companies are thus well positioned to be large providers of fiber-based second and middle mile transport to other ISPs over the next several years.

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[59] *See* DukeNet's website: http://www.dukenet.com/Services_Territory.asp.

[60] *See*, *e.g.*, FCC National Broadband Plan Workshop, Deployment – Wired (Aug. 12, 2009), Tr. at 35 (Dallas Clement, EVP and Chief Strategy and Product Officer, Cox Communications: "Relative to wireless backhaul from cell sites . . . I'll tell you that in our commercial business it's a growth area. We're getting calls in our franchises from wireless providers who are preparing for their 4G networks and they're looking for lower cost alternatives for back haul. And because we're there and we can do sort of spurs off our network, we feel as though it's a big growth area and we're deploying capital to that area to be able to satisfy that demand."), http://www.broadband.gov/docs/ws_02_deploy_wired_transcript.pdf; Q4 2008; *see also* USTA Report at 23-42.

In other cases, ISPs aggregate their purchases to obtain second and middle mile service discounts. For example, an organization of ISPs called the Federation of Internet Solution Providers of America ("FISPA"), purchases discounted backhaul facilities throughout AT&T's 22-state region. FISPA's website explains that "FISPA Membership entitles you to participate in several discounted product lines of goods and services and/or elevated support offered through several FISPA vendor arrangements," and FISPA has vendor arrangements with a long list of Internet providers.[61]

In addition to all of this existing second and middle mile expansion into rural areas, many states and network providers have applied for a portion of the billions of dollars in federal stimulus moneys for the purpose of expanding second and middle mile services into rural areas. For example, North Carolina is seeking $28.1 million for a middle mile network as "part of a coordinated strategy to improve broadband access for businesses and residents in underserved areas, and enhance feasibility of Health Internet Technology (HIT) initiatives across the state, resulting in improved access to health services."[62] "The Massachusetts Broadband Institute voted . . . to apply for $100 million in funds . . . . for the design and construction of . . . a 'middle mile' of fiberoptic infrastructure to assist 43 unserved and underserved western Massachusetts towns."[63] "Project partners for the NFOL, led by Kodiak Kenai Cable Company, have applied for funds . . . to deploy a shovel-ready, 3,500 mile 'middle-mile' submarine fiber optic network

[61] *See* FISPA website: http://www.fispa.org/offers.php.

[62] Broadband Stimulus Round I Applicants: North Carolina Seeks $28.1 for Middle Mile Network with Detailed Filing (Sept. 4, 2009), http://www.stimulatingbroadband.com/2009/09/broadband-stimulus-round-i-applicants_04.html.

[63] Michael Norton, State To Ask Feds For $100 Mil To Deliver Broadband To Rural West Towns, Massachusetts Broadband Institute (Aug. 13, 2009), http://www.massbroadband.org/news/clips/081409snh.html.

across Western Alaska – covering the largest and most remote unserved area of the country."[64] 360Networks has applied for funding of a middle mile network that "will access 17 rural markets in addition to a surrounding 10-mile radius along the service provider's existing 1,011-mile optical network route."[65] Level 3 has also applied for middle mile funds, asserting that "it plans to use a combination of the funding and its own money to install new equipment in existing buildings located in rural areas along the route of its network" to "create . . . middle mile connections" to serve its rural customers, as well as "government agencies," "local schools" and "colleges."[66]

II. QUESTION NO. 2.

Availability and Pricing of Middle and Second Mile Connectivity. A number of different regulatory frameworks apply to the pricing and availability of point-to-point transmission services that may be used by purchasers for middle mile and second mile transport. For example, a purchaser may obtain DS3 or OCn connectivity out of a tariff or contract, and in certain situations DS1 and DS3 connectivity may be available as an unbundled element. Packet-switched connectivity using Fast Ethernet or gigabit Ethernet technology may be available under tariff, contract tariff, or de-tariffed service, depending on the service provider. For purposes of the National Broadband Plan, however, what matters is whether sufficient connectivity is adequate, reasonably priced, and efficiently provided in all areas of the country. As a result we are seeking comment on the price, cost and availability of middle mile and second mile connectivity with a focus on rural, unserved, and underserved areas.

Questions 2.a & 2.b. What is the price of purchasing middle [and second] mile connectivity, broken down by relevant geographic areas and technology (e.g., DS3, microwave, OCN, Fast Ethernet, Gigabit Ethernet). How much do these prices vary by length of the

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[64] Marisa Torrieri, *Shovel-Ready Kodiak Kenai Cable Co. Hopes for Middle-Mile Money to Fund Broadband Buildout in Alaska*, 4G Wireless Evolution (Oct. 20, 2009), http://4g-wirelessevolution.tmcnet.com/broadband-stimulus/topics/broadband-stimulus/articles/67086-shovel-ready-kodiak-kenai-cable-co-hopes-middle.htm.

[65] Sean Buckley, *360Networks Throws Hat into Broadband Stimulus Funding Ring*, Fierce Telecom (Aug. 27, 2009), http://www.fiercetelecom.com/story/36onetworks-throws-hat-broadband-stimulus-funding-ring/2009-08-27.

[66] Sean Buckley, *Level 3 poses itself as middle mile broadband provider*, Fierce Wireless (Aug. 23, 2009), http://www.fiercetelecom.com/story/level-3-poses-itself-middle-mile-broadband-provider/2009-08-23.

circuit? Precisely how do these prices for middle [and second] mile connectivity vary by category of supplier (e.g., incumbent LECs, competitive providers, wireless providers, interexchange carriers, Internet backbone providers) and by different regulatory treatment of that connectivity (e.g., when available as an unbundled network element, when available as a tariffed service subject to rate-of-return or price cap regulation, when subject to pricing flexibility, or when subject to no ex ante rate regulation)? Precisely how do these prices for middle [and second] mile connectivity vary by category of purchaser (e.g., wireless broadband service provider, cable system, local telephone company)?

Response To Questions 2.a & 2.b. There is no single "price of purchasing middle [and second] mile connectivity" that can be "broken down by relevant geographic areas and technology." To be sure, AT&T and others have "list prices" (also known as "rack rates")[67] for these services, but, as Question 2.c recognizes – and as is well documented in other proceedings and has been acknowledged by the Commission – almost no customer actually pays those "list" prices. Competitive suppliers of second and middle mile services compete aggressively to win a potential customer's business by designing the best possible combination of service, quality, reliability and price. The prices that customers actually pay for second and middle mile connectivity, therefore, typically reflect significant term, volume and, where regulations permit, negotiated discounts. Consequently, it is simply not possible to report a single price that applies to any geographic area or technology.

The question also asks how prices for second and middle mile services vary by length of the circuit. Obviously, it costs more to provide fiber-based services over longer distances than shorter distances, because providing such services over longer distances requires more facilities and equipment (*e.g.*, fiber cable) and other costs, including the costs of obtaining rights of way for the fiber, the costs of trenching or otherwise burying the fiber cables, and the myriad other costs that go along with deploying a physical cable down streets, under roads and sidewalks,

[67] AT&T's list prices for DS3, OCn, and Ethernet products can be found in AT&T's tariffs and guidebooks, which are publicly available at http://www.att.com/tariffs.

over fields, and so on. Consequently, fiber transport services typically a have a mileage component. It is important to recognize, however, at least with the price cap ILECs, that per-mile prices (and field discount authority) generally vary little between non-rural and rural areas.[68]

The costs of second and middle mile *wireless* services are much less sensitive to distance. As discussed above, the facilities needed to provide wireless services are essentially the same within broad ranges of distances in which line of sight can be maintained and for which spectrum is available.

The Commission next asks how "prices for middle mile connectivity vary by category of supplier (*e.g.*, incumbent LECs, competitive providers, wireless providers, interexchange carriers, Internet backbone providers)." AT&T is unaware of any clear trend in pricing linked solely to the category of supplier. Rather, suppliers compete intensely to offer customers the best combination of services, and the prices they offer depend on numerous factors, including, among others, reliability, capacity, latency, number of circuits, and term of purchase. The entity that offers the best combination of these factors, including price, typically wins the business. In one instance that entity may be some type of fiber-based provider (a cable company, a CLEC, or an ILEC), or it may be some type of wireless provider. Accordingly, there is no simple way to categorize the prices charged by different providers.

The next part of this question asks how prices vary by regulatory treatment of the service. As several studies have now shown, and as AT&T and others have repeatedly demonstrated, where carriers have been given the flexibility to negotiate prices on an individual case basis,

[68] *See*, *e.g.*, http://www.att.com/tariffs.

prices for second and middle mile services are lower.[69] Ironically, the one area where AT&T and other price cap ILEC suppliers of second and middle mile services are still subject to significant pricing regulation is DS3 and lower capacity services in rural areas; the lack of pricing flexibility in those areas hampers carriers in their ability to offer additional contract-based discounts off of tariffed prices.

The last part of this question asks how "prices for [second and] middle mile connectivity vary by category of purchaser (*e.g.*, wireless broadband service provider, cable system, local telephone company)." AT&T does not distinguish between "category of purchaser" when providing second and middle mile services. AT&T's list prices are the same for all customers, and AT&T will compete vigorously to win the business of any customer by negotiating steep discounts from those list prices where it is permitted to do so.

Question 2.c. How large are discounts from tariffed rates for middle mile and second mile connectivity obtained from incumbent local exchange companies. For example, the results of a recent special access buyer and seller survey conducted by the National Regulatory Research Institute regarding incumbent LEC special access services reported discounts from tariff "rack rates" for DS3 connectivity range from 44-68% for channel termination, 7% for fixed dedicated transport, and 68% for variable (e.g., mileage) dedicated transport charges. How accurate are these discount estimates? Does the availability of discounts vary by geography or density zone, and if so, by how much? Do these discounts vary when competitive alternatives are present, and if so, by how much?

Response to 2.c. Based on AT&T's extensive experience as a competing provider of such services, AT&T agrees with NRRI that typical discounts for channel terminations and for the mileage component of transport services are often within the stated range; sometimes discounts are even steeper. However, in AT&T's experience, NRRI's estimate that typical discounts for the fixed component of transport services is only in the 7% range is incorrect.

[69] *See*, *e.g.*, Gov't Accountability Office, FCC Needs to Improve Its Ability to Monitor and Determine the Extent of Competition in Dedicated Access Services, 14 (Nov. 2006) (Where incumbents have been granted pricing flexibility, "[a]verage revenue for channel terminations and dedicated transport for DS-1 and DS-3 has generally decreased over time").

Prices for transport services typically include two charges, a fixed monthly fee for mileage ranges (*e.g.*, 0-15 miles) and an additional per-mile monthly fee. To the extent NRRI means to suggest that the discounts for the mileage ranges are only in the 7% range, that is inconsistent with AT&T's experience. In AT&T's experience, the same range of discounts that are available for the mileage component are also applicable to the fixed mileage component.

The Commission also asks how these discounts vary based on geography or density zone. The discount ranges discussed above include both term and volume discounts that are available to all customers, and such discounts would typically be available throughout the relevant density zone. Additional discounts can be negotiated with customers in areas where price cap LECs have been granted the necessary pricing flexibility to negotiate lower prices on a case-by-case basis. In areas where the price cap LECs have not been granted pricing flexibility, these additional case-by-case discounts are not available, and thus the overall discounts may be lower.

Question 2.d. What discounts from tariff "rack rates" or list prices are available for other services, such as OCn, Fast Ethernet, or Gigabit Ethernet? Do these discounts vary by regulatory treatment of the service? Does the availability of discounts vary by geography or density zone, if so, by how much? Do these discounts vary when competitive alternatives are present?

Response to 2d. OCn and Ethernet services are intensely competitive businesses with many competing providers. Although incumbent LECs offer these services, they have no inherent advantage over others, and those services are not rate regulated. Many other companies are major players in this marketplace, and, as a recent studies confirm, there is very low concentration in this marketplace.[70] Accordingly, providers of second and middle mile OCn and Ethernet services offer very deep discounts from their "rack rates." These discounts typically

[70] *See*, Vertical Systems, Vertical Systems Group: Business Ethernet Leaderboard: Mid-2009 Results, available at http://www.verticalsystems.com/prarticles/stat-flash-0809_Mid2009_Leaderboard_prnews.html.

include term, volume, average revenue commitment, and other discounts that are typically available to all customers pursuant to pricing guides. In addition to these generally available discounts, customers can typically negotiate even lower prices for such services. In AT&T's experience overall discounts from rack rates as high as 60-70% are not at all unusual for OCn and Ethernet services.

The Commission has largely deregulated the provision of OCn and Ethernet second and middle mile services, and as a result, the regulatory treatment of these services typically has an insignificant impact on the level of discounts. In AT&T's experience these discounts are typically available in most or all geographic areas.

Question 2.e. Do broadband Internet access service providers purchase circuit-mode services (such as DS1, DS3, or OCn) for the purposes of second mile and/or middle mile transport? If so, in what circumstances do they do so and to what extent? For instance, have providers opted for this strategy in areas in which packet-switched transport services such as Fast Ethernet or Gigabit Ethernet have been subject to regulatory forbearance by the Commission or because packet-switched services were either unavailable or too expensive? What are the costs associated with converting a DS1, DS3, or OCn circuit to an IP connection? How much of these costs would be avoided if a broadband ISP had the ability to purchase a transmission service that obviated the need for such conversion, such as Fast Ethernet, Gigabit Ethernet, or other packet-switched service for both the second and middle mile transport? Is functionality lost during these multiple conversions?

Response To Question 2.e. The vast majority of AT&T's Internet access customers today rely on circuit-mode services for second and middle mile transport. Although a minority of AT&T's Internet customers have opted for packet-switched solutions, such as Ethernet, AT&T expects purchases of such services to increase substantially relative to circuit-mode services over the next several years. Businesses are increasingly adopting packet-based solutions, and packet-based solutions will be required to support LTE technology.

Price is not a barrier to the adoption of packet-switched services. In many instances, Ethernet solutions are very cost effective, both because the electronics and equipment for such

services can be less expensive and because Ethernet services often can be purchased in smaller megabyte increments and are in some ways more easily upgradable. The reason why there are relatively fewer packet-based services in use today compared to circuit-based service is likely due solely to the fact that Ethernet services are relatively new compared to circuit-based services, which have a large embedded base of users.

This question also asks about the costs of converting DS1, DS3, or OCn circuits to an IP connection. This is an issue about which there has been some confusion in the past. IP connections, such as Ethernet services, merely refer to the protocol used to transmit data. They do not require a special "Ethernet Loop," indeed, there is no such thing as an "Ethernet Loop."[71] Rather, Ethernet services can be provided over virtually any transmission medium, including copper, fiber, and wireless facilities. The only thing that is needed to provide Ethernet are the appropriate electronics designed to transmit and receive IP-traffic, and once those electronics are installed, Ethernet services can be fully enabled. Nor is any "functionality lost" when using copper, fiber, or wireless facilities for Ethernet – indeed, AT&T and others routinely use copper facilities to provide Ethernet services.[72]

It is also incorrect to suggest that there are "costs to converting" a circuit-based facility to an Ethernet facility. Customers can either buy a traditional circuit-based connection and add their own Ethernet facilities, or they can purchase a finished Ethernet product that includes the necessary electronics. The notion that adding the electronics is an "extra cost" is thus a misconception – those electronics are required no matter what. Moreover, purchasers have had success obtaining Ethernet service doing it both ways. For example, as explained in the

[71] The Commission has made this precise finding, which was upheld by the D.C. Circuit. *See Ad Hoc Telecommunications Users Committee* v. *FCC,* 572 F.3d 903, 910 (D.C. Cir. 2009).

[72] AT&T 2007 Special Access Comments, WC Docket No. 05-25, Reply Declaration of Parley Casto (attached to Supplemental Declaration of Parley Casto), ¶¶ 9-10 (filed Aug. 15, 2007).

declaration submitted by Parley Casto in the special access proceeding, Time Warner Telecom's expert witness has testified Time Warner Telecom "has relied [] on . . . DS1 and DS3 AT&T ILEC loops with TWTC-provided Ethernet equipment to compete in the provision of Ethernet in the AT&T ILEC territory."[73]

Question 2.f. Given current and projected demand and supply conditions, what portion of the overall cost of providing broadband Internet service to an end user is attributable to middle mile and second mile transport? Does this portion of cost vary by distance or length of circuit, and to what extent? Using specific examples, data, and detailed analyses of deployments in different population and customer densities, please demonstrate whether and how the price of obtaining middle mile and/or second mile transport affect the business case for broadband deployment, both now and in the future.

Response to Question 2.f. The portion of overall costs of extending broadband services to an end user that is attributable to middle/second mile transport is an extremely complicated economic and fact-based question. It depends, for example, on the amount of additional capacity needed to serve the new customers, which in turn depends on several factors, including among many others, the usage characteristics of the existing customer base, the expected usage characteristics of new customers, and the ISP's network management practices. The cost of deploying such capacity also depends on myriad factors, including the costs of obtaining construction permits, access to right of ways, labor (which varies by time of year and location), transportation and vehicles, contracting, sheath, pole attachments (if deployed using aerial facilities), and trenching (if deployed underground). And all of these costs depend on additional factors, including terrain, weather conditions, local ordinances and regulations, availability of existing poles and conduit, and other factors.

[73] AT&T 2007 Special Access Comments, WC Docket No. 05-25, Supplemental Declaration of Parley Casto, ¶ 16 (filed Aug. 15, 2007) (quoting Declaration of Graham Taylor, ¶ 43, WC Docket No. 06-74 (filed June 6, 2006)).

The Commission also asks whether the costs of second or middle mile transport vary by distance. As explained above, the costs of wireline-based second/middle mile transport necessarily depends on distance, because it simply costs more to deploy longer circuits.

The one thing that can be stated with certainty, is that whatever the costs for a particular ISP to expand services, such costs are not prohibitive. As explained above, ISPs have deployed in rural areas, and where the distance and density might otherwise make deployment uneconomic, marketplace solutions have been and continue to be deployed to overcome those issues.

III. QUESTION NO. 3.

Pricing and Availability of Internet Connectivity. In addition to obtaining both middle and second mile transport, to provide broadband service to end users, broadband internet service providers also need to purchase capacity from internet backbone providers, such as dedicated Internet access ("DIA") ports, which are generally sold in increments of dollars per megabits per month. The price and availability of these ports may vary based upon geographic location and whether these ports are obtained from Tier 1 or other Internet providers.

Question 3.a. What is the current price per megabyte per month for a DIA port charged by Tier 1 Internet Backbone service provider? Likewise, what is the current price for other forms of Internet backbone connectivity available to Internet services providers, such as a transit agreement. What are the current prices for similar connectivity from a Tier 2 or Tier 3 Internet backbone service provider? How do the prices for Internet backbone connectivity vary as volume demanded or ordered increases? To what extent do these prices include (or exclude) Internet transit service. Is the price for Internet backbone connectivity declining over time, and, if so, at what rate do parties expect it to decline over the next five and ten year period? How much do these prices vary for different categories of purchaser.

Response to Question 3.a. As discussed below, there is intense competition for dedicated Internet access ("DIA") ports, with dramatically falling prices, both in urban and rural areas. However, before these specific questions can be answered it is important to clarify the terminology used in the industry. Many providers offer DIA services, which permits the customer to gain access to the Internet – *i.e.*, to exchange traffic with anyone in the global Internet. AT&T's primary DIA service is Managed Internet Service or "MIS." Broadly

speaking, AT&T's non-consumer MIS services,[74] are offered to two general classes of customers: (i) business customers that need Internet connectivity (*e.g.*, to provide Internet access to their employees and to connect their content/application servers to the Internet), and (ii) smaller Internet service providers that need to connect their end users to the Internet (this service includes transit service that allows the customer to connect to any Internet end point that is connected directly to AT&T's network or connected indirectly to AT&T's network through peering relationships that AT&T maintains with other networks).

DIA services are different from "peering," which refers to arrangements between two similarly sized network providers – *i.e.*, providers that exchange roughly equivalent amounts of traffic – under which the parties agree to exchange traffic without payment (*i.e.*, non-compensatory peering).[75] Peering arrangements are limited to the exchange of traffic to and from end points connected directly to the peering partners' networks; they do not permit access to the entire Internet (*i.e.*, they do not permit the exchange of traffic to or from end points that are connected to another network that is connected to the network of one of the peering partners).

In the peering context, the terms "Tier 1," "Tier 2," and "Tier 3" networks have traditionally been used to refer to the size of the network. Those with the most direct connections and traffic are the Tier 1 networks. All of these networks, regardless of which "Tier" they are in, typically provide connectivity to the entire Internet. The difference is how they obtain that connectivity. Tier 1 networks obtain such connectivity by peering with other Tier 1 networks, while at the same time providing DIA services to smaller networks, including ISPs and other business customers. Tier 2 and Tier 3 networks typically obtain such connectivity

[74] Consumer MIS service includes, for example, AT&T's consumer DSL offerings.

[75] In some circumstances, the parties to a peering arrangement may agree to compensate each other if the traffic they exchange reaches certain thresholds (*i.e.*, paid peering).

by entering into peering arrangements with other Tier 2 and Tier 3 networks and by purchasing DIA services from Tier 1 networks in order to reach end points not served by the Tier 2 and Tier 3 networks with which they peer. Rural ISPs typically have smaller networks and therefore would not have sufficient traffic volumes and network capabilities to qualify for peering arrangements.[76] Accordingly, ISPs typically purchase DIA (transit) services from one of these providers to obtain Internet connectivity.

There is intense competition among the many Tier 1, Tier 2 and Tier 3 DIA providers. There are approximately nine different Tier 1 providers (including non-U.S. based providers),[77] and dozens of Tier 2 and Tier 3 providers – including international providers that have entered the U.S. marketplace.[78] As a result of this intense competition, the prices that customers pay for DIA ports from Tier 1 Internet backbone providers have been falling like stones – by more than 50 percent in the past few years – and there is no reason to believe that prices will not continue to fall over the next several years.[79]

The Notice asks what is the "price per megabyte per month for a DIA port charged by a Tier 1 Internet Backbone service provider," but there is no single or easily ascertainable "price

[76] In some circumstances, a rural ISP may be large enough to qualify for a peering arrangement with a Tier 2 or Tier 3 provider.

[77] Tier 1 providers include AT&T, Verizon, Sprint, Qwest, Level 3, Global Crossing, Tata Communications, NTT Communications, Savvis, TeliaSonera.

[78] Tier 2 and Tier 3 providers include Abovenet, Cogent Communications, XO Communications, Paetec/US LEC, Time Warner Telecom, Eschelon Telecom Inc., Cogent Communications, Speakeasy, Embarq, McLeodUSA, AOL Transit Data Network, Covista, IDT Corp., Trinsic, Excel, Primus Telecom, PowerNet Global, Access One Inc., Splice Communications, and Acceris.

[79] *See, e.g.*, *U.S. Dedicated Internet Access Services Market*, Frost & Sullivan, at 2-3, 2-4 (2009) (DIA "[c]ustomers are currently requesting rates at half what they were in 2009. Previously customers only looked for 30 percent write down on contract renewal, now they want 50 percent.").

per megabyte per month."[80] AT&T and other Tier 1 providers publish guidebooks setting forth list prices.[81] However, customers rarely pay those list prices. Rather, customers typically negotiate very steep discounts from these list prices on a case-by-case basis. These discounts depend on numerous factors, including the term of the arrangements, the volume of traffic, and myriad other factors. AT&T is aware of Tier 1 providers offering discounts of 80% or more from the list prices.

A common misconception is that Tier 2 and Tier 3 providers offer inferior access or have higher prices than Tier 1 providers. In fact, Tier 2 and Tier 3 providers often offer DIA services at prices below those of Tier 1 providers.[82] AT&T often cannot match the prices of these smaller carriers because AT&T provides costly service level agreements – *i.e.*, guaranteed reliability, speed, and so on – and other value added components that many Tier 2 and Tier 3 providers choose not to offer.

The question further asks how the price for DIA service increases with the amount of volume. As in most competitive industries, DIA service reflects volume discounts, so that the per-unit price for DIA is generally lower for higher volumes of traffic. The question also asks whether there are different prices for different categories of customer. AT&T is unaware of any pricing based on the category of customer.

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[80] AT&T notes that when services are sold on a per unit basis, they are typically sold on a per mega*bit* basis, not on a per mega*byte* basis.

[81] The AT&T MIS Guidebook is available at: http://www.ATT.com/tariffs.

[82] One reason for the misconception that Tier 2 and Tier 3 providers have higher prices stems from the belief that Tier 2 and Tier 3 providers typically need to purchase DIA service from the Tier 1 providers to provide full Internet connectivity, and thus must mark their prices up to levels above the Tier 1 providers DIA prices. But this analysis is incomplete. As noted, Tier 2 and Tier 3 providers obtain a large portion of their Internet connectivity by entering into peering arrangements with each other that allow them to reach each other's customers for free.

Question 3.b. Does the price for connecting to an Internet backbone vary from location to location, and to what extent? Are prices in large cities (such as the top 25 metropolitan statistical areas) for Internet backbone connectivity less expensive than in smaller cities and towns, and by how much? If so, is this because backbone connectivity prices in smaller municipalities include a substantial a middle mile transport component? What is the range of prices, from the most urban to the most rural of settings? How much of that price range is attributable to sheer distance as opposed to the presence (or non-presence) of a Tier 1 backbone in the closest metropolitan area?

The list prices for AT&T's DIA service are the same in every location within the 48 contiguous states. Moreover, a customer purchasing AT&T's DIA service typically does not have to obtain transport all the way to a location where AT&T has a physical connection to its Internet backbone. Rather, a customer must obtain only a connection to one of the more than 600 nationwide AT&T MIS points of presence ("POPs"); the MIS port list price includes transport (or "backhaul") from that AT&T MIS POP to an AT&T Internet backbone connection point.

For example, AT&T's wholesale price for an OC3 MIS port includes backhaul from an AT&T MIS POP to AT&T's Internet backbone. Therefore, if a customer is located 50 miles from an AT&T Internet backbone connection, but only 1 mile from an AT&T MIS POP, the customer must obtain only 1 mile of middle mile access to reach AT&T's MIS POP, and the 50 miles of backhaul to AT&T's Internet Backbone is included in the MIS port price. AT&T's MIS field discount authority allows discounts for these circuits that are the same for up to 100 miles backhaul between an AT&T POP and an AT&T's internet backbone.

The other cost incurred by AT&T MIS customers is the cost of obtaining transport to the AT&T MIS POP. The prices for those services are discussed in response to Question 2, above, and as explained there, the cost of wireline middle mile access increases with distance, whereas the cost of second and middle mile wireless transport is far less sensitive to distance.

Question 3.c. What concentration ratio do broadband ISPs utilize in purchasing Internet backbone connectivity? How does an incremental additional megabit of required throughput in the last mile affect the need for a second and middle mile transport service and why? Can these concentration ratios be affected by caching, and to what degree?

Response to Question 3.c. There is no fixed, simple mathematical formula governing the relationship between an incremental megabit at the last mile and the need for second and middle mile transport services. Much of the relationship depends on the unique characteristics of the ISP's traffic, such as the promised service level and the peak demands that its customer base places on the system, which may vary significantly depending on the mix of customers the ISP serves (*e.g.*, residential, small business, enterprise). ISPs can take measures to reduce the extent to which last mile facilities place higher demands on second and middle mile facilities. Caching is certainly one example – if the provider is able to cache information closer to the customer, the need for traffic to traverse the second and middle mile facilities is reduced.

AT&T's ISP operations, for example, do not set second and middle mile capacity using a fixed "concentration ratio" based on last mile capacity. Rather, AT&T typically uses historic demand levels for particular second and middle facilities to predict future capacity needs for those facilities, and AT&T sizes those facilities based on those predictions. AT&T then continuously tracks utilization rates for its second and middle mile facilities, and if those utilization rates reach certain thresholds (but before they reach exhaustion), AT&T augments them.

Question 3.d. Given current and projected demand and supply conditions, what portion of the overall cost of providing broadband internet service to an end user is attributable to Internet backbone connectivity? Does this portion of cost vary by distance to the nearest Tier 1 connection point, and to what extent? Using specific examples, data and detailed analysis of deployments in different population and customer densities, please demonstrate whether and how the price of obtaining Internet backbone connectivity affects the business case for broadband deployment, both now and in the future.

Response to Question 3.d. Internet connectivity (*i.e.*, DIA service) typically comprises only a small portion of the overall costs of providing broadband Internet service to end users. The two largest network-related cost components ISPs incur are last mile distribution costs (*i.e.*, the costs of connecting each individual end user to the ISP) and middle mile costs (*i.e.*, the costs of the transport facilities that carry traffic to a DIA access point). Which of these two network costs is greater and their absolute magnitude depends on numerous factors, including the distribution of end user customers (the further customers are spread out, the larger the distribution costs), the number of end user customers, local topography, the technology used by the ISP, the distance to the DIA access point, and numerous other factors described in more detail below in response to Question 4.c. There are also very significant non-network costs that are typically greater than the cost of obtaining Internet connectivity. These costs may include, among others, customer care, customer acquisition, and customer retention costs, as well as costs associate with pre-ordering, ordering, provisioning, and maintenance.

IV. QUESTION NO. 4.

Question 4.a Is the provision of a high-capacity fiber optic middle mile or second mile connection to a particular location a natural monopoly in some locations? If so, how can the Commission identify those locations and determine the cost of serving those locations?

Response to Question 4.a. Any claim that high-capacity *fiber optic* middle or second mile connections are a natural monopoly in any location is difficult to reconcile with the reality that such connections today are often subject to facilities-based competition, even in rural areas. Moreover, the mere fact that a route is served today by only one competitor does not mean that provision of service on that route is a natural monopoly. Often several competitors will compete for the right to provide service on a route, and the winner will provide services on rates and terms that reflect the competition and bargaining that led to the agreement. The fact that other types of providers, such as power and cable companies, have their own ubiquitous networks that

they are increasingly adapting to provide broadband service makes it even less likely that there are fiber-based connections that are natural monopolies.

Question 4.b. To what extent do providers self-provide or integrate components of middle mile and/or second mile transport? Are certain types of providers—such as cable operators—more likely to self-provide these services, perhaps because they can utilize that bandwidth not only for broadband Internet access but also for the delivery of video programming? Do wireless broadband service providers self-provide middle mile and/or second mile transport? If so, as a function of percentage of all second and middle mile transport consumed by each category of broadband service provider (e.g., cable, wireless, local telephone company), how much does each category of broadband service provider self-provide that connectivity? For each category of broadband service provider, what portion of self-provided middle and second mile transport is in rural, as opposed to urban, areas? For each category of broadband service provider, what is the rate of growth of self-provisioning in rural areas as opposed to urban areas?

Response to Question 4.b. There is significant evidence that many broadband providers self-provide or integrate components of middle and second mile connectivity, and the extent to which they are doing so appears to be increasing. For example, cable providers today have typically built their own middle and second transport facilities to a carrier hotel location, at which they can connect to multiple Internet backbone providers. Many wireless broadband providers also self-provide second and middle mile transport; numerous wireless providers have announced major, multibillion dollar campaigns to upgrade their backhaul facilities to accommodate increased traffic from broadband services.[83] From the standpoint of AT&T as a seller of MIS service, although many MIS customers purchase a port and access, a substantial number of customers do "bring their own access" and purchase only the MIS port.

The extent to which a broadband provider may choose to self-provide or integrate its own facilities into its second and middle mile arrangements depends on a host of factors, including its

[83] Yankee Group 4G Network Backhaul Summit, *PowerPoint Presentation of CFN Services*, at 4 (Sept. 15, 2009) ("ILECs and MSOs are aggressively building out the fiber infrastructure; Verizon (ILEC) will have fiber to 80%+ of all sites in region by 2012; AT&T (ILEC) has fiber deployed or planned to most high capacity sites; . . . CLECs, Utilities, and other Alternative Access Vendors, More limited fiber footprint than incumbents but better economics")

own business plans, the nature of its network, the nature of its customer base, and many other factors. To the extent that more and more broadband providers (such as cable companies) are constructing their own second and middle mile facilities to Internet access points, however, it is reasonable to assume that broadband providers will benefit from increased wholesale options and competition.

Question 4.c. What are the categories of the capital expenses of constructing second mile and/or middle mile transport? What are the categories of operating expenses of operating second mile and/or middle mile transport? On a per-mile basis, what are the levels of each of those categories of capital and operational expenses? What are the primary factors that affect these costs? How does distance from the nearest Internet point of presence affect each of these categories of costs? Which, and what percent, of these costs are affected by rights of way and pole attachment fees and charges? Do these charges vary based upon who owns or controls the pole, duct, conduit, or right of way? Do these costs vary by percentage of outside plant that is aerial, buried, or conduit, and if so, by how much?

Response to Question 4.c. There are many categories of capital expenses associated with the construction of wireline second or middle facilities that depend on what exactly is being constructed and where it is being constructed. These categories include network design, construction permits, access to right of ways, labor (which varies by time of year and location), transportation and vehicles, contracting, and materials (such as sheath). For aerial placement, additional costs include pole attachment fees and the costs of the physical plant and attachments, which, in turn, depends on numerous environmental factors that affect the length of each span of wires that can be deployed. For underground cable, costs include underground structure (*e.g.*, conduit and ducts), trenching (which varies in cost depending on soil conditions and substructure congestion, such as other utility equipment), surface conditions (*e.g.*, higher costs for digging under streets and sidewalks than dirt, and there are higher costs where there are stringent local restoration requirements), municipal resurfacing requirements, availability of conduit and manholes, and other factors. These costs vary depending by location, terrain, weather

conditions, local ordinances and regulations, availability of existing poles and conduit, and other factors.

The question further asks about the relative costs of the capital and operational expenses of constructing second and middle mile transport. These too will vary depending on the type of construction, distances involved, and other factors. Generally, however, transport costs are heavily weighted toward capital costs. The question also asks how the distance from the nearest Internet point of presence affects these categories. The same categories of costs typically exist regardless of their proximity to an Internet point of presence.

In addition, the question asks how these costs are affected by rights of way and pole attachment fees. As noted, these fees are a significant cost category that varies from location to location depending on local regulations, terrain, and other landscape features. These costs also vary depending on whether the outside plant is aerial, buried, or conduit, but the relative costs depend on multiple factors that in turn depend on where the facility is deployed, because the relative costs of each category can vary significantly by terrain and other conditions.

AT&T notes that in previous proceedings in which the Commission has examined the cost of building second and middle mile facilities, it has relied on evidence and cost estimates from urban settings, in which providers were typically faced with deploying facilities through city streets in crowded downtown areas. Many of these costs are often significantly lower in rural areas. For example, labor costs are typically lower in rural areas than in urban areas. Trenching costs are also often dramatically lower; indeed, establishing second and middle mile transport facilities through unpopulated rural areas is far simpler (and thus less costly – on a per foot and per mile basis) than digging through city streets, and carriers can sometimes even bury naked fiber optic cables through such areas.

For a wireless deployment, the principal categories are the electronics; either purchasing or leasing spectrum; labor; and either constructing cell towers and obtaining tower siting approvals or leasing space on a cell tower. As noted, microwave backhaul facilities often can be extremely cost effective in rural areas, especially in flatter areas with longer sight lines.

Question 4.d. Do existing long-haul fiber optic service providers offer either middle mile or second mile transport service to all communities that are passed by their long-haul fiber? Why or why not? What are the cost and economics of building a local "on-ramp" or fiber access point at these locations?

Response to Question 4.d. Although the question does not define what it means by a community that is "passed" by long-haul fiber – passed within one mile? fifty miles? – the construction of any spur off of a long-haul network would depend on the request and the economics of the individual situation. The decision whether to build would be made like any other build decision, based on the costs of construction and the amount of traffic that the customer would expect to carry over the facility – in other words, accounting for the distance and density challenges involved. Level 3, for example, just announced a major initiative targeting rural wireless broadband providers and constructing connections from its long-haul network to nearby cell towers.[84]

Question 4.e. To what extent, if any, is the availability of adequate, reasonably priced, and efficiently provided middle mile and second mile transport infrastructure in an area limited by access to capital? Are there areas in which future or forward-looking demand would support a higher capacity circuit, but that circuit is not constructed either due to risk, uncertainty of that demand, or other capital constraint?

[84] Press Release, *Level 3 Launches Wireless Tower Access Service* (Oct. 22, 2009), http://www.level3.com/index.cfm?pageID=491&PR=815 ("Level 3 . . . today announced the launch of Level 3 Tower Access – a new service that offers direct wireless tower connectivity to the Level 3 network. Tower Access provides wireless carriers with more efficient and cost-effective options for wireless backhaul in metropolitan and rural locations. The first phase of this initiative will target unserved and underserved markets focusing on areas with the greatest concentration of end-user demand").

Response to Question 4.e. AT&T is not aware of any situation in which capital would be unavailable for the construction of high capacity circuits that would be supported by future or forward-looking demand. Indeed, the fact that a wide range of broadband and other providers are currently spending billions of dollars to construct new backhaul facilities strongly suggests that capital is available and is not a barrier to the construction of needed facilities. Moreover, both the federal and state governments have made funding broadband deployment a priority; Congress has passed the Recovery Act, which makes $7.2 billion available (much of it targeted to second and middle mile facilities), and many states have parallel efforts underway.

Question 4.f. To what extent do competing or neighboring broadband service providers work together (such as in consortia or collaboration) to upgrade and share middle or second mile facilities in places where it would not have been feasible for such upgrades to occur if those providers were operating independently? Have local and state governments encouraged or facilitated such upgrades? Alternatively, are there state laws, rules, regulations that prohibit or restrict the operations of such public-private partnerships? Are there examples of successful infrastructure sharing or public-private partnerships that might serve as models for similar initiatives nationally?

Response to Question 4.f. There are many instances of competing or neighboring broadband service providers working together in consortia to lower their backhaul costs. As noted, the Federation of Internet Solution Providers of America, or "FISPA" for one, represents numerous ISPs that have banded together to purchase discounted backhaul facilities throughout AT&T's 22-state region. FISPA's website explains that "FISPA Membership entitles you to participate in several discounted product lines of goods and services and/or elevated support offered through several FISPA vendor arrangements," and FISPA has vendor arrangements with a long list of Internet providers.[85] There are other examples of ISPs forming cooperatives to band together to purchase DS1s or DS3s in bulk to achieve larger discounts on second and middle mile facilities.

[85] *See* FISPA website: http://www.fispa.org/offers.php.

In addition, as discussed above, in many states ILECs have banded together in statewide consortia to construct and operate shared fiber rings, which also serve to decrease costs significantly for backhaul facilities.

Question 4.g. If some government subsidy or action is necessary to facilitate construction of second mile and middle mile facilities, please identify the type of government action that would be adequate, such as the proposed regulatory action, explicit funding, or tax credits. If a subsidy is necessary, identify how large a subsidy is required, both in terms of the percentage of overall deployment costs as well as an estimated number.

Response to Question 4.g. If the Commission determines that there are some situations in which government assistance for second or middle mile facilities is necessary for the country to achieve its broadband goals, the Commission should use only direct and explicit *subsidies* that are both competitively and *technologically* neutral. As discussed above, many parties have proposed such subsidy mechanisms under the Broadband Stimulus plan.

By contrast, the Commission should not attempt to pick backhaul winners and losers with subsidies or other policies that give one type of provider an advantage over another. There are a number of different types of technological backhaul solutions that different providers are pursuing, and the Commission cannot and should not attempt to predict which of these technologies will prevail in the marketplace. Indeed, because of the highly varied nature of rural areas, a technology that may be highly successful in one part of the country may be extremely ill-suited to success in another part of the country.[86]

[86] *See, e.g.*, Rural Broadband Report, ¶ 80 ("The best choice for any particular area in all likelihood will reflect, in addition to the population density and terrain of the area, the capabilities and limitations of the technology or technologies under consideration. The technology choice should take into account the ability of each feasible solution to provide cost-effective broadband connectivity in a given area based on consistent, high-quality performance that ideally will be capable of evolving over time to meet the growing requirements of Internet access and may well combined a variety of wireline and wireless elements."); *id.*, ¶ 11 ("The solution for rural broadband should reflect consideration of the full range of technological

Additionally, whatever it does, the Commission should not mandate price reductions for particular providers, such as mandated rate reductions for wireline backhaul services. As AT&T has explained elsewhere, artificially slashing the rates for one type of service, such as wireline special access, would only induce artificial dependence on one type of technology, and would discourage investment in alternatives and experimentation with other technologies.[87] The only way to maximize the availability of backhaul over the coming years is to make competitively and technologically neutral subsidies available in the most rural areas.

V. QUESTION NO. 5.

Question 5.a. How do firms compete in providing middle mile transport services? Do firms compete on a circuit-by-circuit basis, by offering connectivity to specific points specified by the customer, or do firms "compete for the customer" by offering customers the ability to order a set of particular circuits at certain averaged or specified prices or terms? How does competition differ between middle mile transport and second mile transport services? Does the nature of competition vary between areas in which high-speed transport network facilities are already in place, as opposed to areas in which such facilities would need to be constructed in order to provide the connectivity requested by the customer? To what extent does a lack of competitive alternatives over some circuits that a particular customer demands affect or limit the ability of that purchaser to acquire or self-provide particular circuits for which alternatives may be available?

Response to Question 5.a. Firms compete in all of these ways. Firms compete on a circuit-by-circuit basis in some cases and the same firms in other cases "compete for the customer" and offer a set of circuits at discounted prices. In AT&T's experience, on any route in which there is sufficient demand to justify second or middle mile connectivity, there are typically multiple competing firms willing and able to build a facility to provide the requested connectivity. That construction could be part of a circuit-by-circuit offer or part of a larger package of services.

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options available, and should not elevate the need for short-term progress over longer-term objectives.").

[87] *See, e.g.*, Letter from James W. Cicconi, AT&T, to Marlene H. Dortch, FCC, WC Docket No. 05-25 (filed June 22, 2009).

Question 5.b. What is the effect on price of the presence of a second or third facilities-based provider of middle mile or second mile transport service? More specifically, when a second provider of middle mile transport service enters the market, how are those services priced in relationship to the incumbent provider's price, and what is the price response by the existing provider? Please provide specific examples of price competition. Does price competition vary if the second provider utilizes a different technology (such as microwave) to provide middle mile or second mile transport? If so, to what extent?

Response to Question 5.b. AT&T routinely negotiates contractual rates and terms, including deep discounts, with almost all of its customers. Price is only one component of these negotiated contracts; AT&T's prices may be higher or lower than its competitors, but AT&T may also offer other non-price benefits to the customer (such as service quality guarantees) that make AT&T's overall offer more attractive. Because these negotiated contracts vary greatly from customer to customer, it is not possible to generalize about the effect on price of a "second or third facilities-based provider." Moreover, even if there is no second competitor, customers in price cap ILEC service areas would receive the benefits of competition in all events, because price cap ILECs' competitively driven rates are tariffed and available throughout their regions.

Question 5.c. To what extent do providers of either middle mile or second mile transport service compete with differentiated products? More specifically, when a second provider of middle mile transport service enters the market, does it offer a differentiated product (such as higher quality of service), and does the incumbent respond with additional differentiated service offerings? Please provide specific examples of competition through product differentiation. Is completion with differentiated products more likely if the second provide uses a different technology (such as microwave) to provide middle mile or second mile transport?

Response to Question 5.c. Competitors do compete to differentiate their products. AT&T, for example, typically guarantees a higher level of service quality than most of its competitors. FiberTower states that its "backhaul networks deliver superior network quality for major wireless carriers" by offering "[s]uperior network availability, reducing outages by more than 60%, lower mean-time-to-repair, reducing repair times by more than 70%, [o]n demand provisioning, 24x7 network monitoring and visibility, [and] [d]edicated, local teams to deliver

operational support."[88] Similarly, TTM offers "Network Surveillance with Alarm Feeds, Performance History and SLA Tracking, Trouble Ticket Management, Site Capacity Reporting, Service Ordering."[89]

Question 5.d. Are there contractual terms and conditions in typical contracts for middle mile or second mile transport that impair or impede the ability of competitors to compete for either middle mile or second mile transport services? Do term requirements or discount contracts hinder or impede the development of competition? In either case, how?

Response to Question 5.d. AT&T is not aware of any contractual terms or conditions in typical contracts that impair or impede the ability of competitors to compete for second or middle mile transport services. As in virtually all competitive industries, incumbent LECs offer a variety of discount plans with a variety of features, including term plans with no volume commitments and volume plans with no term commitments – which disproves the claim sometimes made by proponents of special access regulation that the only way customers can avoid base tariff rates is to agree to unfair terms that preclude them from using alternative providers' services. Indeed, no customer is "forced" to accept any particular type of term or volume limitation – rather, a customer agrees to those terms as part of a bargain for a particular type or level of discount, just like in other competitive markets. *BellSouth Corp* v. *FCC*, 469 F.3d 1052, 1060 (D.C. Cir. 2006) (access discount plans are "most naturally viewed as a bargain containing terms that both benefit and burden its subscribers").

Both the Commission and the courts have found such terms lawful and beneficial. Indeed, the D.C. Circuit found nothing unlawful with a discount plan that required customers to purchase "no less than 90% of what they purchased on an annualized basis in the six months

[88] FiberTower, http://www.fibertower.com/corp/solutions-backhaul.shtml.

[89] TTM Website: http://www.ttmi.info/services.

preceding their subscription to the plan."[90] The court stressed that complaints about incumbents' discounts must be measured against the "critical fact" that incumbents have "no obligation to offer a discount plan at all" and thus on their face, these discount plans necessarily offer more benefits to consumers than non-discounted rates.[91] Further, as to this plan's 90 percent purchase requirement, despite the Commission's detailed review of the evidence, the court determined that it "imposed no burden on [purchasers] at all," because "nearly five years of data" showed that particular purchasers of the plan at issue either had significant "headroom" or could have enjoyed more headroom but for their "free choice" to "voluntarily increase[] their commitments."[92] In short, customers are undeniably better off in an environment in which they have the unrestricted ability to negotiate whatever discount arrangements best meet their individual needs.

Question 5.e. Some have asserted that the vast majority of incumbent LEC special access DS1 and DS3 revenues are generated within a minority of wire centers. What is that revenue density relationship for OCn, Fast Ethernet, Gigabit Ethernet, or other packet transport services? Please provide details as to the concentration of OCn, Fast Ethernet, Gigabit Ethernet, and other packet transport service revenues within each decile (by overall line count) of incumbent LEC wire centers. What percentage of revenues from DS1, DS3, OCn, Fast Ethernet, Gigabit Ethernet, and other packet transport services, respectively, are derived from wire centers that are not equipped to provide Digital Subscriber Line or other end-user broadband services technology?

Response to Question 5.e. As AT&T previously has demonstrated, approximately 80 percent of AT&T's DS1 and DS3 revenues are generated within about 20 percent of its wire centers. For Ethernet, about 80 percent of AT&T's revenues are generated within less than 10 percent of its wire centers, and for OCn services, about 80 percent of AT&T's revenues are generated in less than 15 percent of its wire centers.

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[90] *BellSouth* v. *FCC*, 469 F.3d 1052, 1055 (D.C. Cir. 2006).

[91] *Id.* at 1057.

[92] *Id.* at 1059-60.

Question 5.f. Which routes are served by more than one facilities-based provider of middle mile transport? How many and which entities offer and sell middle mile transport services to broadband Internet service providers on those routes? On routes not currently served by more than one facilities-based provider of middle mile transport, on which routes do commenters believe there to be sufficient demand to support a second provider?

Question 5.g. Which routes are served by more than one facilities-based provider of second mile transport? How many and which entities offer and sell second mile transport services to broadband Internet service providers on those routes? On routes not currently served by more than one facilities-based provider of second mile transport, on which routes do commenters believe there to be sufficient demand to support a second provider?

Response to Questions 5.f and 5.g. AT&T cannot meaningfully answer this question, as there are hundreds of thousands of second and middle mile routes across the country and AT&T does not have full information about the location of other companies' facilities or how much demand exists on each of these routes. Moreover, the mere fact that a route today may have only one facilities-based provider does not mean there is no competitive discipline on that provider's prices; competitors often bid competitively to serve a route in the first place, and that provider's rates and terms will reflect that competitive bidding.

In all events, a focus on individual routes is not appropriate. As AT&T and others have shown, wireline second and middle mile facilities blanket the areas where demand is concentrated, wireless microwave backhaul is economically feasible in many rural areas, cable and power companies have ubiquitous networks in rural areas that are being adapted to provide backhaul services, and other technologies exist as well. The proper focus is on *potential* competition, because a large majority of second and middle customers across the country are within striking distance of one or more of these networks. AT&T and other ILECs have submitted extensive, publicly available evidence of where those networks are located, but second and middle mile competitors have consistently refused to provide definitive evidence of the location of their networks and the full extent of the locations that they could economically serve.

Respectfully Submitted,

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November 4, 2009